



GCM01

AUTOMATIC MICROPROCESSOR CONTROL PANEL FOR STAND-BY GENERATOR



MANUAL:

- INSTALLATION
- USE
- MAINTENANCE

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1. USER MANUAL

GENERAL FEATURES

We congratulate you for having purchased the GCM01 control panel for handling your generator unit. As you read through this manual you will realise the outstanding performance and variety of applications offered by this supremely technological unit.

This electronic microprocessor module not only completely controls the generator and its switching but, is also pre-arranged for the direct serial communication with a PC. Moreover using a GSM unit, your generator can be completely remote controlled from miles away.

The GC-M02 unit is equipped with a complete set of digital testers that are required to monitor all mains, generator and motor parameters.

To make the control of the unit absolutely comprehensible the manual is split up into two parts, namely:

1. The first **USER MANUAL** part has been prepared to provide a clear and simple guide to help you use the generator rapidly, completely and safely.
2. The second **TECHNICAL MANUAL** part has been prepared to provide complete and detailed instructions for skilled personnel to start up the generator correctly.

1.1 PURPOSE

The manual has been prepared specifically for the user of the generator unit.

Information required for the following is provided:

1. **To learn the operational principle of the unit;**
2. **To interpret the indications given on the electronic control panel;**
3. **To control it for the various operational requirements;**
4. **To perform the basic checks required ensuring the efficiency of the generator itself.**

Technical or adjustment matters are not dealt with as these involve the installation engineer when setting up the system.

1.2 OPERATIONAL PRINCIPLE

HOW DOES A STAND-BY GENERATOR UNIT WORKS

Fig.1 shows the system components that consist of a public mains **R**, a generator unit **G-M**, and a command and control panel **QGE** with a built-in mains contact maker **CR**, a generator unit contact maker **CG** and the **GCM01** module

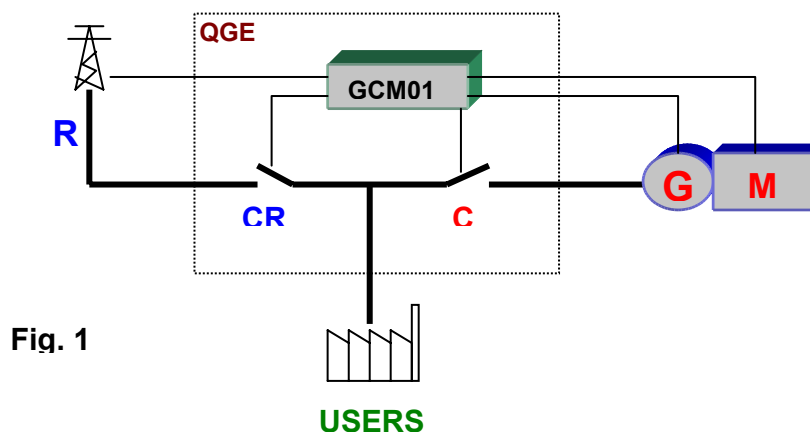


Fig. 1

USERS

Supposing that the mains **R** is within the normal limits, the **CR** mains contact maker is closed therefore the utility is powered from the mains. The **GCM01** module controls the **R** mains and if there should be a drop in voltage, a phase should be missing or the phases should be dissymmetrical, the control panel:

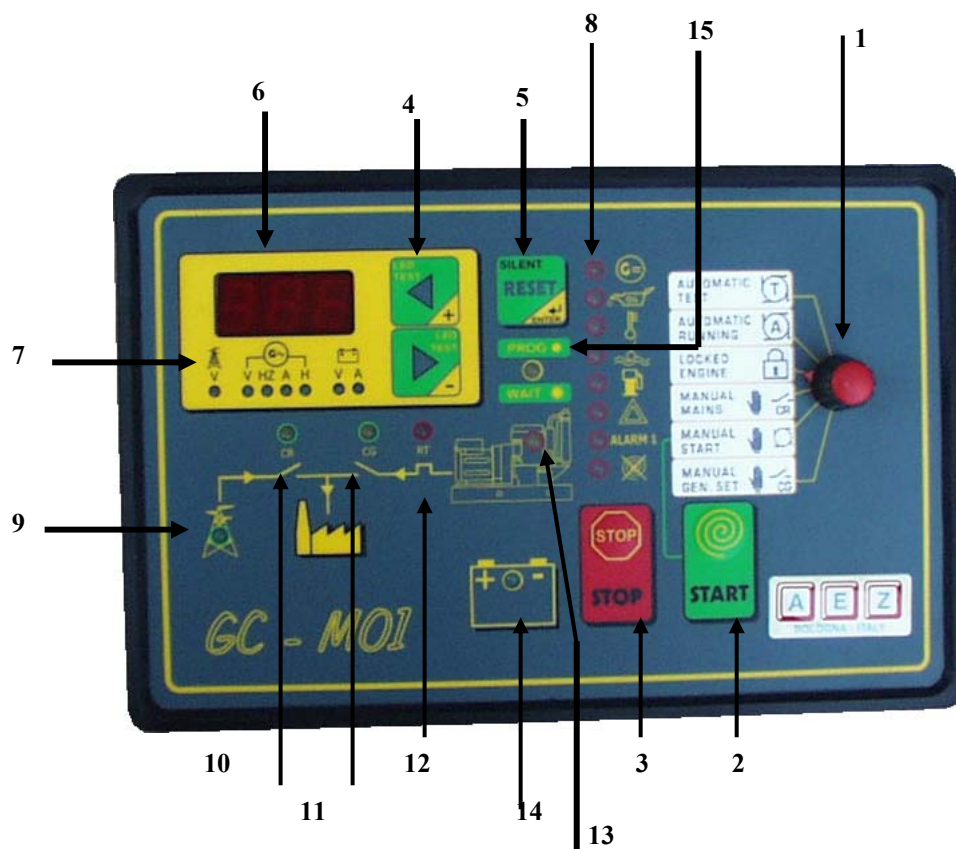
1. Opens the **CR** mains contact maker;
2. Starts the **G-M** generator unit, which when the established operating conditions are reached, the **GCM01** module closes the **CG** contact maker that then powers the utility from the generator unit **G**;
3. When running, the engine **M** and the generator **G** are safeguarded against possible anomalies, which if encountered cause to stop the generator immediately;
4. When the **R** mains is restored within the normal limits, the **GCM01** module after an adjustable delay, opens the contact maker of the **CG** generator and one second later closes the **CR** contact maker, thus powering the utility from the mains again;
5. The generator continues to run for at least another minute to cool down after which it stops automatically;
6. Only reserve and overload.

To ensure the perfect efficiency of the generator a battery charger automatically holds the battery perfectly efficient. An automatic fuel filling system constantly keeps the correct level in the daily tank. A pre-heating system maintains the motor

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at the ideal temperature so that it is ready to start whenever necessary.

1.3 VIEW OF THE GCM01 UNIT



Description of the components

- 1 : Programming switch
- 2 : Start button only with (1) manual start mode.
- 3 : Stop button
- 4 : Display reading selection push buttons display (6).
- 5 : Reset/Enter push button used to reset the functions and to eliminate an alarm status and also to confirm parameters entered in the programming phase.
- 6 : Alphanumerical display that shows all the parameters together with the literal description of the type of alarm
- 7 : Leds which show the visualized measure, and indicate parameter's anomaly if flashing.
- 8 : Led for engine alarm, (a) battery charger dynamo failure, (b) oil pressure low, (c) engine temperature high, (d) water/oil level low, (e) fuel reserve, (f) remote and local safety stop button ON, (g) reserve alarm 1 (to define), (h) start failure alarm.
- 9 : Led indicates mains presence within normal limits.
- 10 : Led indicates mains contact maker closed and use supplied by mains.
- 11 : Led indicates generator unit contact maker closed and use supplied by generator unit.
- 12 : Intervention led of generator overload protection, has to be reset manually.
- 13 : Generator unit ON
- 14 : Supplied module.
- 15 : Led PROG/WAIT; fixed: programming mode, flashing: timing phases or automatic running delay.

1.4 CONTROLS

The operational modes that can be selected with the programming switch are six, namely:

1. **Automatic test:** This starts to test the generator without disconnecting the mains power supply from the utility. When the switch is turned back to automatic mode the generator stops following a delay of roughly one minute **(it is used for periodic tests or to check the running efficiency following maintenance)**.
2. **Automatic mode:** if there should be a failure in the mains the circuit board responds by opening the mains contact maker. Once the mains is re-connected, after a certain time, the utility is switched back to the mains and the generator is stopped **(this is the normal operational situation)**.
3. **Lock:** this sets the generator in a locked status. It completely disables every possibility of starting while the mains powers the utility. This mode is used to work on the system in complete safety, being certain that the

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generator will not start even if the mains should be disconnected (**it is used during maintenance**).The mains' voltage control it's not active.

4. **Manual mains:** this enables power supply output from the mains even if the command and control electronics are faulty (**it is used when the generator is left inoperative**).
5. **Manual starting:** this enables the generator to be started manually using the **start** push button. The control is direct without the involvement of electronic components. It ensures the operation of the generator even when the electronics are faulty (**it is used for the manual emergency controls or for maintenance purposes**).
6. **Manual generator:** this enables the forced power supply from the generator (**it is available for manual procedures or in the case of problems with the automatic functions**).



WARNING

When the programming switch is in this position all the utility circuits of the generator are powered such as the solenoid valves, electronic rpm regulators etc. If the switch were in this position with the generator stopped the starting battery would run flat very quickly.

STOP

This is enabled whatever the situation (enabling even only in manual mode)
It is to be held down until the motor stops completely

EMERGENCY STOP

If pressed, the red mushroom push button in the middle of the door stops the generator immediately, instantaneously opening the contact maker of the generator (CG) thus locking it.

To release the emergency status set the programming switch in Lock position and then turn the emergency push button and pull up.

A newly conceived and remarkably useful LED has been fitted on the GCM01 module to assist the operator, namely the **WAIT/PROG LED**. This LED flashes each time the timer is triggered informing the operator what is happening even over a lengthy timer period.

All leds are provided with a general description that makes the control panel easily comprehensible.

LED TEST

To verify the functioning of all the leds, bring the programming hand grip to lock.Hold the + /- push buttons down together for 2 seconds.



ALARM SILENCING

Hold the RESET key down for 2 seconds to silence the buzzer alarm.



FUNCTIONS RESET

Hold the RESET key down for 2 seconds to reset the alarm status and to restore the functions.

SUMMARY

In normal running the generator unit is programmed in AUTOMATIC mode.

During maintenance on the generator unit put it on LOCKED ENGINE.

With no intervention need even in case of mains failure, set the programming switch in MANUAL MAINS. Thus the supply by mains would be assured.

CLC SIGNAL

With the setting of the automatic TEST or AUTOMATIC LOCK, in case of disconnection of the battery the timer has to be reprogrammed.

To indicate the loss of the programming, on the display appears CLC for 0,5" every 1,5".

It does not have any influence on emergency functioning; it is only a call-up for the re-programming of the timer.

FLASHING HOUR LED

Indicates maintenance requirement when programmed hours are up.

HOW TO PROCEED IF THE GENERATOR SHOULD FAIL TO WORK

A possible alarm status will be shown on the display. Whatever the anomaly, the cause is to be found first and foremost then press the RESET push button twice. The causes and the solutions differ depending on the type of anomaly involved:

1. Flashing led 7: electrical anomalies due to min./max. voltage and frequency. If the anomaly should persist after the RESET push button has been pressed then request technical assistance;
2. Led .8: anomaly due to low oil pressure,(b) high motor temperature,(c) low water or oil level,(d) fuel reserve.(e) Check the relative levels (water, oil, fuel) and top-up if necessary then reset;
3. Led .8: anomaly of the battery dynamo. (a) In this case request technical assistance;
4. Led .8: alarm(f) due to local or remote emergency stop status. Set the programming switch on LOCKED mode, turn and pull the emergency push button enabled then reset;
5. Led .8: alarm due to failed starting,(h) try starting with manual control and inform the supplier;

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6. Led 13: The generator overload protection switch has tripped. It is to be reset manually by a qualified engineer (see **maintenance** section).

1.5 MAINTENANCE

SECURITY PROCEDURES FOR THE USER



WARNING

It is strictly prohibited for anyone to touch powered parts.

1.5.1 ELECTRICAL MAINTENANCE

Skilled personnel must perform all jobs.

The control unit is equipped externally with all the possible command, control and reset functions.

Proceed as follows to access the equipment within the control panel:

1. Set the programming switch on LOCKED mode.
2. Check if the unit has stopped completely.
3. Disconnect the mains line that powers the control panel and switch the main switch ON/OFF of the mains off.
4. Check if the mains has been effectively disconnected, which can be seen by the mains **OK** LED switched off and by the display switched to the mains that must indicate zero.
1. Open the control panel and check for any anomalies in the:
 - Fuses;
 - Automatic switches;
 - Thermal relays.

Once maintenance has been completed repeat the procedure in reverse order to reset the unit.

1.5.2 MECHANICAL MAINTENANCE

If the generator should fail to start due to an anomaly in the fuel circuit and also in an emergency status, the following tips may prove useful.

How restore the fuel circuit:

1. Set the programming switch on Manual Start mode without starting the generator. In this way the 15/54 that powers the fuel interception solenoid valve is activated.
2. Once you have filled up with fuel, operate the hand pump situated on the motor until the circuit is restored, which can be seen by the pump becoming harder to move.
3. Start in manual mode (It is advisable to restrict the starting attempts to 10 seconds each with a pause of 15 seconds in-between to allow the battery to recover efficiently). Once the unit has started and is running regularly reset the automatic functions.

1.5.3 PERIODIC CHECKS

To keep the unit efficient some periodic checks must be made together with those scheduled by the manufacturer of the motor and by the installation engineer:

1. Check the electrolytic level of the battery every 15 days following installation and request the assistance of an engineer if an excessive consumption is noticed. Following the initial period check every 90 days;
2. In generators complete with motor pre-heating system check if the motor is warm each time a check is made otherwise request technical assistance. (WARNING: a cold motor at low temperatures could have difficulty in starting or outputting once started);
3. If the generator is rarely triggered due to the lack of mains power supply execute an automatic test for at least 2 minutes.
4. If new electrical machines are installed in the system powered by the generator, request technical assistance to check the suitability of the CG/CG mains/generator switching to the new load.

SUMMARY

On a periodic basis check the electrolytic level of the clear batteries. Touch the motor to feel if it is warm (if equipped with pre-heating system) and execute an automatic test.

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2. TECHNICAL MANUAL

2.1 CONSTRUCTIONAL DESCRIPTION OF THE CONTROL PANEL

The control panel is entirely manufactured in compliance with the following European standards:

ANS low voltage electrical control panels

EN 60439-1

EMC electromagnetic compatibility directive

89/336/EEC

Each control panel or device is completely tested and supplied with test certificate, declaration of conformity and EC marking in compliance with 626 safety standards.

The control panel is manufactured in a steel sheet cabinet, 15-20/10 that is skilfully treated and painted with standard grey silicon epoxy powder, Ral 7032, and has a standard protection rating of IP 42.

EXTERNAL COMPOSITION

The control panel consists of the following:

1. GCM01 electronic circuit board that houses the control logic, control and reading of the operational parameters of the generator;
2. Emergency stop mushroom push button (optional);
3. Nameplate with operational standards;
4. Nameplate with safety instructions.

INTERNAL COMPOSITION

1. Numbered cables placed within PVC sheathing;
2. 10 x 38 fuses with not fixed fuse boxes;
3. Battery charger transformer of adequate capacity;
4. Automatic generator protection switch (if provided);
5. Switch with tetrapolar contact makers of adequate capacity for the power of the unit, interlocked mechanically and electrically and scaled in AC1 in compliance with standard **ISO DIS 8528-4**;
6. Three amperometric transformers for measuring the generator and mains current;
7. Terminal for the mains and generator inputs, the utility output and any auxiliary connections;
8. Safety fuse gauges and connection terminals nameplate.

Switching is controlled directly by CG and CR relays built in the MP-GCM01 module, which directly command switching via not powered contacts.

IMPORTANT

The CG and CR command contacts are normally closed to allow the command circuits, in the case of certain anomalies, to force the mains contact maker to close. For example by disconnecting the battery and also the power supply to the battery charger transformer the mains contact maker is forced to close.

FUNCTIONING

MEASURES

All parameters are visualized on three displays of seven sections.

All the reading pages are controlled using the < and > push buttons, which run in both directions.

The reading pages available are the following:

- Mains voltage
- Generator voltage
- Generator frequency
- Generator current
- Hour counter
- Battery tension
- Battery charger current

If an alarm is triggered it will be shown on the display. For example a low oil pressure, fuel reserve, high battery voltage alarm, etc.

CONTROLS

The GCM01 control panel equipped with a programming switch to select the following functions controls all operational modes:

TEST

It performs all the automatic functions with the exception of the switching function.

It tests the efficiency of the whole system without disconnecting the mains power supply to the utility.

All safety devices are enabled while the test is running.

If the mains should be disconnected while the test is running the generator starts immediately. The test ends automatically when the mains power supply is restored or following a programmed external command.

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AUTOMATIC MODE

It's the normal working condition.

In case of mains anomaly the generator unit starts automatically after few seconds with the delivery for utility (closing CG).

During running the generator is protected against all anomalies, which if encountered would cause the stop of the generator and the visualisation of the cause on the relative.

When the main is restored within the normal limits after cc. 1 min. the commutation GEN(CG)/MAINS(CR) takes place and after few minutes the generator stops automatically.

LOCKED STATUS

It is the safety condition for simple maintenance operation on the generator.

Guarantees utility supply through mains, blocks any start possibilities of the generator. If the engine is running it stops automatically.

POWER SUPPLY FROM MAINS

Forces the utility supply through mains, exclusion of all automatic circuits.

Exclusion of automatic intervention of the generator unit

MANUAL START

Enables the push button START that starts the generator. Enables the supply of the auxiliary circuits through 15/54.

START

Engine start push button, for the start up cycle

POWER SUPPLY FROM GENERATOR

After a few seconds break, to allow the oil lubrication to all parts moving, bring the commutator of programming to enables the power supply of the utility from the generator.

STOP

The stop push button is enabled at all times. Press it until the motor stops completely.

RESET / SILENT

Press ones the push button RESET to deactivate the acoustic alarm, press twice to deactivate the alarm status and bring back to use the normal functions of the electronic module.

LED TEST

To verify the functioning of all signal leds, select with the programming switch LOCKED ENGINE.

And press +/- for 2"



2.2 HOW IT WORKS

TEST

- A. Does all automatic functions (commutation excluded).
- B. Allows verifying the whole system without cut off the output.
- C. During the running all protections are operating.
- D. In case of mains failure, the generator starts immediately.
- E. The test running stops, in case of coming back in automatic mode or with a programmed external command.

AUTOMATIC FUNCTIONING

- A. The DIP SWITCH 1 selects a three-phase or two-phase sensor to monitoring the mains.
In case RIF MONO use, don't use the three-phase reading even if available.
The mains sensor guarantees the following controls:
 - Drop from -5% up to - 30% of nominal voltage (t16adjustable) even of a single phase.
 - Rising from +5 up to 20% of nominal voltage (t15 adjustable) even of a single phase
 - Phase lack;
 - Wrong angle between phases (dissymmetry)
- B. Encountering one of the above-named anomalies, the mains contactor opens immediately as to assure the running of the generator even in case of high voltage drops.
- C. In case of mains failure the **start delay** timer is activated (t5); it makes the system insensitive to short mains interruptions.
- D. The 5 start cycles begin after the START DELAY (t0) and last 5" (t1), with pauses 5"
- E. In case of start failure, after the start cycles (5") the signal FAILED START appears.
- F. Delivered voltage and frequency of the generator are measured when the speed is reached; when they restore within the normal parameters of functioning the **generator delay** will be activated (t3), after this time the generator contactor will be closed (CG).
- G. During the functioning the following functions and signalisations are active, which are displayed at their intervention:

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N°	DESCRIPTION GESTIONE FUNZIONALE	COLOR LED	STATUS LED	ACOUSTIC ALARM	IMMED. STOP	STOP DELAY
	ENGINE					
1	Failed start	R	F	A		
2	Oil pressure low	R	F	A	YES	
3	Level low	R	F	A		
4	Water temperature high	R	F	A		SR
5	Generator battery charger	R	F	A		SR
6	Alarm available	R	F	A		SR
7	Fuel reserve	R				SR
8	Hour counter (maintenance requirement)			A		
	BATTERY					
9	Battery present	V	F			
10	Battery overvoltage (fixed thresholds)	V	L	A		
11	Battery undervoltage (fixed thresholds)	V	L	A		
12	Battery overload (fix threshold)	V	L	A		
	GENERATOR					
13	Overvoltage (59)	V	L	A	YES	
14	Undervoltage (27)	V	L	A		SR
15	Overload (51)	V	L	A		SR
16	Max frequency (81)	V	L	A	YES	
17	Min frequency (81)	V	L	A		SR
18	Generator contactor closed (ON)	G	F			
19	Generator presence	G	F			
	MAINS					
19	Mains presence	V	F			
20	Overvoltage (59)	V	L			
21	Undervoltage (27) dissymetry (60)	V	L			
22	Mains contactor closed	G	F			
	VARIOUS					
23	Wait/Prog	G	L F			
24	Acoustic alarm			A		
25	Emergency button active	R	F	A	YES	

Legend

R = Red	V = Green	G = Yellow	F = Fix
L = Flashing	A = Acoustic alarm ON	SI = Immediate stop	SR = Delayed stop
27 = Min. voltage	59 = Max. voltage	51 = Overload	81 = Min/max frequency

H. What happens in case of alarm with immediate stop?

- Immediate opening of the generator contactor.
- Activation of immediate stop.
- Activation of acoustic alarm.
- Memorization of alarm cause.
- Recording of all parameters and signalisations.
- Block status up to re-establishment

An alarm with a delayed stop brings about:

- ❖ Immediate opening of the generator contactor
- ❖ Activation of immediate stop.
- ❖ Memorization of alarm cause.
- ❖ Only after engine's cooling phase, stop and block status up to re-establishment.

In case of alarm the display will automatically show the relative page and light the relative led.

Press ones the push button RESET to deactivate the acoustic alarm, pushing twice to deactivate the alarm status and re-establish the normal functions of the electronic module.

- I. When the voltage is restored within normal limits the mains re-enter delay timer (t2) is active and enables mains stabilization before sending load on it.
- L. After commutation, which has a pause of 1", the cooling phase of the engine starts cc. 20"(t4) and to which ends the stop is activated and kept for about 10" .
- M. Ready for a new cycle
- N. With mains presence the fuel reserve, water level and overload protections are operating.

LOCK STATUS

- A. If the generator is working the block status activates immediately it's stop.
- B. Supply of all starting circuits is deactivated.
- C. Guarantees safe maintenance.

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2.3 MANUAL CONTROL FUNCTIONS

The manual operational mode is considered as an emergency back-up mode for the automatic functions. It also ensures the operating efficiency with the micro-controller in an abnormal condition. The programming switch ensures the direct commands that are not backed-up by electronic logics. This means that when the START push button is pressed for example, the starting motor will be operated for as long as the push button is held down.

The following functions are possible:

1. Forced power supply from the mains CR;
2. Manual starting, the generator CG contact maker is opened;
3. The mains CR contact maker is opened and the power supply is forced from the generator;
4. Manual stoppage;

POWER SUPPLY FROM MAINS

This enables the mains power supply permanently and disables all the electronic functions with the exception of the battery charger and the EMERGENCY stop function.

MANUAL STARTING

This provides the 15/54 commands that power all the generator utilities. It enables the start push button and once the generator is running at a steady state the programming switch is set on the following function that enables the generator.

With the generator running all the safety devices are enabled. As these are however controlled entirely by the electronics its failure could disable them.

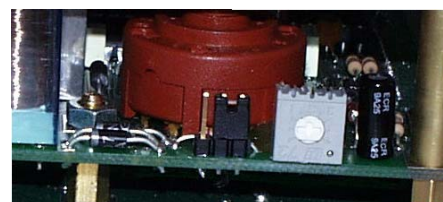
POWER SUPPLY FROM GENERATOR

This enables the power supply of the utility from the generator, in case of intervention of the engine protections the generator stops with inserted load.(this solution is not technically correct, but it's the only way to have the 99% of the working GE with the electronic failures).

MANUAL STOPPAGE

The stop push button is enabled at all times.

By moving the jumper, located on the right side of the module, on the pin 1 and 2 instead 2 and 3, the stop push button is enabled only in MANUAL START mode.



2.4 VARIOUS FUNCTIONS AND STANDARD UTILITIES

The module GCM01 includes all power parts: programming switch mains sensors, battery charger, power supply status, commando...etc.

PROGRAMMING SWITCH SW1

4 switches enable to select eight different working modalities.

SW1	POSITION ON	POSITION OFF
1	BATTERY VOLTAGE 12V=	BATTERY VOLTAGE 24V=
2	MAINS SENSOR SINGLE-PHASE	MAINS SENSOR THREE PHASE R-S-T 500V MAX
3	MOTOR PROTECTION BPO ATM POSITIVE	STANDARD PROTECTION NEGATIVE
4	PROGRAMMING OPERATING	STANDARD PROGRAMMING

SUPPLY CIRCUITS CC.

The GCM01 is fitted with the first level safety device against excessive power supply voltages: the module is able to operate constantly up to 40V and it can also withstand transitory voltages above 250V. A second level safety device is also fitted against inverted polarity of the power supply, which prevents the circuits in which it is encountered from being powered. Any anomalies cause the F1 fuse to trip (16A) that cuts-out all the electronic circuits.



WARNING

If, after having powered the control panel the battery LED should fail to light up, check the POLARITY OF THE BATTERY before operating any commands. Possible connection errors could cause electronic anomalies in the MP01 module if commands are operated with the poles inverted.

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COMMAND RELAYS

Three relays 16A command the starting, stopping and utilities 15/54. These are safeguarded by one single fuse; F1 (16A) considering that only one relay is enabled at a time.

Two relays are free contact 10A and command the contact maker of the commutation and generator (CG-CR).

THREE-PHASE MAINS SENSOR

To activate the three-phase sensor set up the SW1 DIP2 in **OFF** position. As it is not possible to work with the two types of mains sensors at the same time, please be sure, before connecting the three-phase mains sensor that the SW1 DIP2 is in OFF position. The connection of the three-phase sensor without setting the relative DIP-SWITCH in the right way could cause a wrong reading of the mains voltage, therefore the module would not work rightly.

The three phase mains sensor is made with three 500 K OHM resistance dividers with high insulation voltage capable of withstanding any excessive voltages of up to 8KV for 1 second. It is sensitive to the minimum and maximum voltage on the single phase and to the phase displacement angle of the three phases.

SINGLE-PHASE MAINS SENSOR

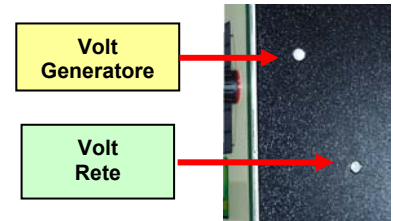
To activate the single-phase mains sensor set up the SW1 DIP2 in **ON** position.

For the single-phase mains sensor you use the output voltage on the secondary of the battery charger transformer. In this configuration the insulation is the same as in the battery charger transformer. It is sensitive to Min and Max voltage.

SINGLE-PHASE GENERATOR SENSOR

A single-phase transformer of separation supplies the sensor. It is sensitive to Min and Max voltage.

On the right side of the module are available two trimmers, (not indicated to avoid wrong use) which enable the adjustment of mains voltage and generator measures.



MOTOR PRE-HEATING

A single-phase power supply is foreseen that is safeguarded by fuses for the motor pre-heating system. The heater on it must be fitted with built-in thermostat.

If required, specific plants to pre-heating system on the motor or generator are possible.

AUTOMATIC BATTERY CHARGER

The automatic battery charger is the double semi-wave type with phase choker, totally controlled by the micro-controller. It keeps the starting battery charged with a max. Load of 5A and the charge is self-adjusted to compensate for consumption and for when the battery automatically runs flat. The voltage of the battery and the charging current can be displayed on the GCM01 unit.

The electronics are built in the GCM01 unit whereas the battery charger transformer is fitted externally.

It is equipped with:

- Automatic cut-out of the charge during the starting phase;
- Electronic restriction of the current to prevent excessive loads;
- Electronic restriction of the voltage to limit the maximum load levels (2,3 V/E) 13,5/27V.
- Protection against short-circuits.
- Protection against inverted polarity.
- Protection against excessive input voltage.
- Protection with low battery voltage for an excessive discharge

POSITIVE MOTOR PROTECTION INPUTS

Some modern motors are equipped with positive outputs to indicate the Low Oil Pressure and High Motor Temperature anomalies. The GCM01 is pre-arranged to communicate with these motors by modifying the SW1-3 from OFF to ON.

MOTOR STARTED READING

This requires no external signal. The control is achieved on two parameters, the first and most important one is the voltage, delivered by the three-phase generator produced only with the presence of the remaining magnetism of the generator. The first signal of STARTED MOTOR is given, when during the start cycle are reached 400/500 rpm, with a voltage between 7 and 8 Volt. If due to an anomaly the generator is not powered the starting phase is stopped once and for all by the second safety control established when the oil is pressured, which triggers a delay of 3 seconds that stops the starting phase.

EMERGENCY

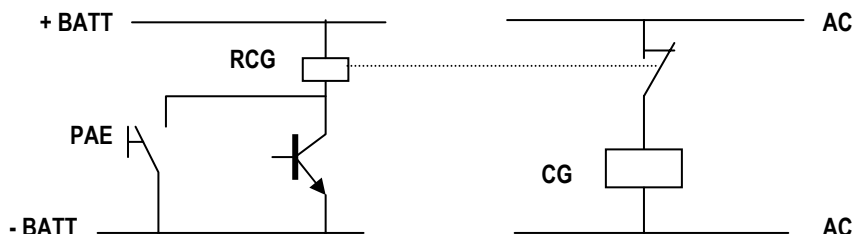
Pre-arrangement for the external emergency command enabled in all operational modes with immediate stoppage of the motor, opening of the generator contact maker and triggering of the alarm.

The emergency device not only controls the control software of the circuit board but is also equipped with an electro-mechanical circuit that totally ensures the stoppage of the unit and the opening of the generator contact maker.

WARNING

The command is double; the NO contact of the emergency push button is required to ensure the immediate opening of the generator contact maker even in the case of an anomaly in the electronics. In fact to ensure the emergency power supply even in extreme cases the contact that commands the mains and generator contact makers (CG-CR) is normally closed (NC), therefore if the contact maker is to be opened, the command relay must be powered.

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HOUR COUNTER AND MAINTENANCE REQUIREMENT(t14)

From 0 to 9999, after the first 999 hours the visualisation changes in 100 :which means 1000 hours and the recording happens every 10 hours. Anyway minutes and seconds are memorized (for example: 1250 = 1.25).

It's foreseen the hours reprogramming in t39

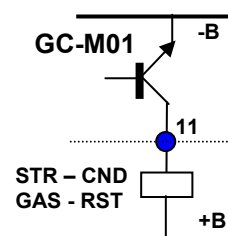
When the relative led is flashing and the acoustic alarm is on, the intervention hours for maintenance (programmed in t14) are up. Do not program when the function RES of two horizontally pivoted Gen-sets is active.

CONFIGURATION OUTPUT11 STARTER

The output 11 can be programmed for four different functions:

1. Starter;
2. Glow plug preheating;
3. Gas electrovalve;
4. Reset.

A transistor with max current 200mA manages the output 11, and it is foreseen to drive an interfacing relay.

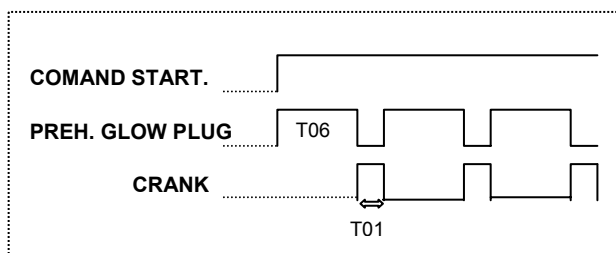


GLOW PLUG PRE-HEATING CND

A transistorised output is provided that may be programmed to command a pre-heating system of the glow plugs. The software controls this output and if programmed to pre-heat the glow plugs, each time it is triggered the pre-heating cycle is enabled before each starting cycle. Program T07 in CND and the glow plug pre-heating time in T06.

Functioning in manual mode: selecting MANUAL START you have only one glow plug signal.

In the case more cycles are required it is necessary go back to MAN MAINS.

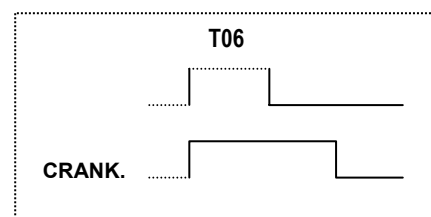


MOTOR STARTER STR (for petrol motor)

In this case at the same time of any start, the output will be enabled for the programmed time in t06. For the programming put T07 in STR and the starter time in T06.

This function is independent from T01 START but blocked by MOTOR RUNNING.

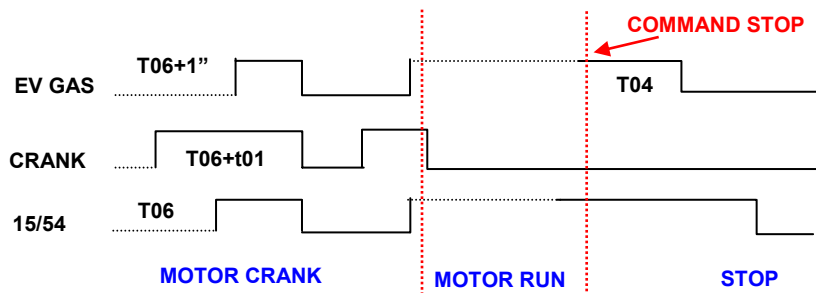
When the START fails, STARTER cuts off; when the START is successful the STARTER goes on, up to the end of cycle (even in manual mode).



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GAS ELECTROVALVE

At the start command, the gas electrovalve opens after the set time in t06 and the start proceeds for the time in t01. Enables to eliminate the unburnt mixture before every starting. In stoppage phase is enabled first the gas electrovalve and then the start advice. Programming t07 = GAS t06 = 0-20" motor prewashing time.



The timing is just an electronic command in automatic mode.

RESET Rst

In remote controlled plants it's necessary to have a command that re-establishes the circuits or closes the switches. The output 11 is active for the time programmed in t06. Programming t07 = RST t06 = 0-20" output time active.

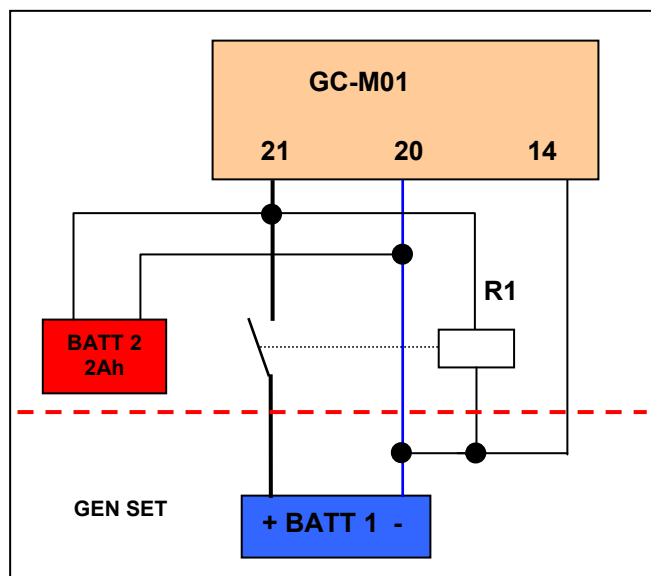
ANTITHEFT DEVICE

Only for GCM01 with serial output RS232C. Only in remote controlled plants installed. In case of disconnection of the generator the alarm status is given by remote control with GSM or MODEM. The conditions are memorized in the alarm report.

FUNCTIONING

With the circuit cut above the generator in relation to the relay R1 of 30A that insulates the battery wiring, and the cable 14 which enables the antitheft device, the module GCM01 is anyway supplied by battery2 which supplies the remote control system Functioning

Programming T40 = fur
With T40 = at the input 14 FREE remains available for normal alarms.



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2.6. EXTERNAL COMMANDS

It is possible to program five different modalities of functioning on the inputs 7 and 8:

1. Remote block command (BLC), so to cut off the start even in case of mains failure. (Night block and week end block for offices, etc).
2. Test starting command (TST), without interfering with commutation.
3. Command with EJP function special for France.
4. Remote start command with forced output even with mains presence (SCR).
5. Gen-set reserve command (RES) for two alternate GE

TEST FUNCTION

By configuring input 7 for the automatic test functioning **TEST**, which enables through remote control to put the generator in automatic mode without cutting off mains power supply. If during the test running the mains fails, the generator immediately supplies the users. Cutting off the command TEST, the generator stops automatically.

Programming: T13 = TST ⇒

The BLC function is disabled

LOCK FUNCTION

By configuring input 7 for the block function BLC, which enables through external command to put the module in a state of forced lock mode; this function is very useful to put the module in night lock or weekend lock.

Programming T13 = BLC.

The TEST function is disabled

FUNCTION EJP

When JP1 is enabled, after the programmed time T12, the generator starts; with the command EJP2 the commutation from mains to gen-set is immediate.

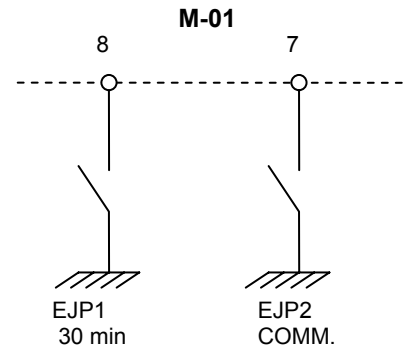
When these inputs are disabled, with connected mains and within normal operating limits, the output is switched to the mains and the motor is stopped following a cooling delay.

The functions SCR and RES are disabled

Programming

T11 = EJP enables the function

T12 = starting delay of 0-28'



FUNCTIONING:

Command EJP1: the gen-set starts without commutation after t12 delay;

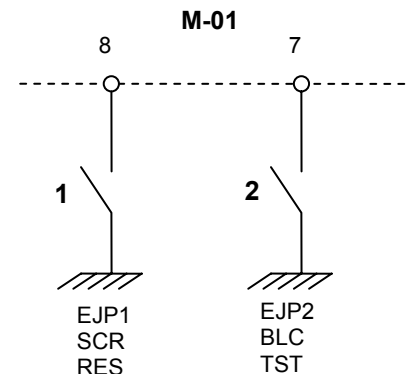
Command EJP2: immediate commutation;

SCR FUNCTION OR FORCED STARTING WITH OUTPUT

The input 8 is suitable for the SCR function. By configuring input T11 in SCR, when this is enabled, it starts the motor with the forced output from the generator. As soon as this input is disabled, if the mains is connected and is within normal operational limits the output is switched over to the mains and the motor is stopped following a cooling delay.

The EJP and RES functions are disabled

CONN	FUNCTION	PROG 1	CONF 1	PROG 2	CONF 2
7 - 8	EJP FRANCE	T11	EJP	T12	0 - 28'
8	SCR forced starting with output.	T11	SCR		
8	RES two GE alternated (One in reserve to the other)	T11	RES	T34	0 - 255 Hours
7	BLC forced lock	T13	BLC		
7	TST test running	T13	TST		



RES FUNCTION FOR TWO GENERATORS THAT RUN ALTERNATELY

By configuring input 8 for the RES function, used in plants composed by two generators one in reserve to the other.

Two applications are foreseen:

1. Two gen-sets one in reserve to the other and in stand-by to mains;
2. Two gen-sets one in reserve to the other, as production central without mains.

The EJP and SCR are disabled

1 STAND-BY TO MAINS

In case of mains anomaly, the pilot generator replaces the mains. If there would be an anomaly during the functioning or if the start attempt fails, the reserve generator is activated and reached the speed it will supply the users.

Programming t11=Res t34=255 ore

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2 CENTRAL STATION WITH TWO GEN-SETS ONE IN RESERVE TO THE OTHER

The pilot generator GE starts after the disconnection of the lock command (BLC input 7). The running time is adjusted in t34.

When the time in t34 is expired, the reserve generator starts and when it reaches the speed it sends a signal to the pilot GE that stops the power output and switches to the reserve GE with a power interruption to the users of 1". At the end of time t34 of the reserve GE the pilot generator is called with the same procedure.

If there would be an anomaly during the functioning of the generator the other one will start automatically.

Programming t11 = RES, t34 = 1-255 working hours, t13 = BLC

To establish the PILOT generator put the programming switch in a position different from AUT (test or lock) for 3" and then switch it back (AUT).

The FAILED START led begins flash to indicate that the PILOT generator and with fix light it indicates failed start.

It is possible to use the internal timer to program the automatic intervention of the power station composed by two gen-sets.

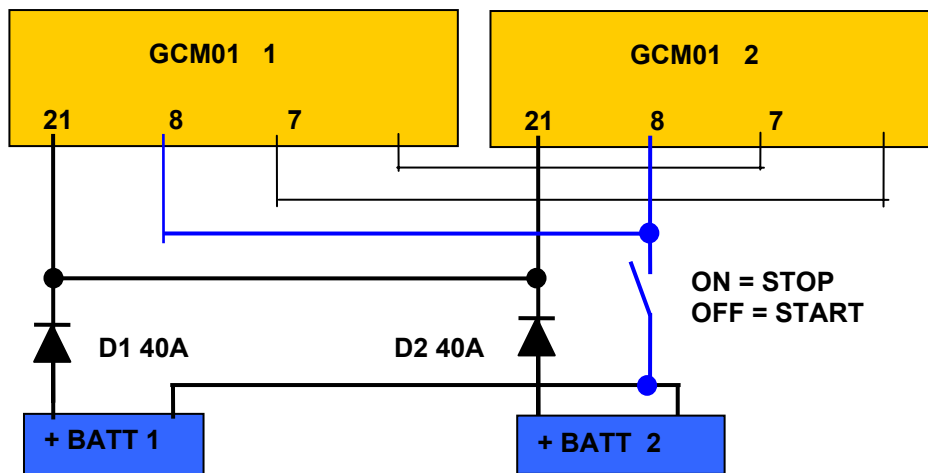
Programming the lock function with the internal timer it is possible to lock each generator for the programmed time.

Given that in case of disconnection of the module GCM01 the timer loses the programming, it is advisable to supply the plant (of two gen-sets) with two diodes D1 and D2 of 40 A.

If you do not use the internal timer the diodes are not necessary.

This circuit with diodes on the battery is suitable only for plants without battery supplied by mains.

WIRING DIAGRAM



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2.7. SPECIAL FUNCTIONS

The GCM01 is arranged with an internal timer to start and stop the generator even with mains failure.

TIMER FOR TEST RUNNING OR AUTOMATIC LOCK

4-programmed fields establish Day and month. It is possible to lose monthly 5' in extreme working conditions

Programming:

T35 = seconds

T36 = minutes

T37 = hours

T38 = actual day of the week

In case of disconnection of the battery the timer loses the programming. On the display will appear CLC for 0,5" every 1,5", therefore it's absolutely necessary to program again the timer.

AUTOMATIC TEST RUNNING

The automatic running can be programmed for 1 to 4 weeks.

The automatic test starts the generator for 5'. A mains failure determines immediately the switching from mains to the generator. When mains come back or the forced test running time expires the generator stops.

T32 = disables OFF or enables the programming week day of the generator in automatic test.

DISPLAY	WEEK	DAY		WEEK 2	WEEK 3	WEEK 4
1 - 1	1	1		2 - 1	3 - 1	4 - 1
1 - 2	1	2		2 - 2	3 - 2	4 - 2
1 - 3	1	3		2 - 3	3 - 3	4 - 3
1 - 4	1	4		2 - 4	3 - 4	4 - 4
1 - 5	1	5		2 - 5	3 - 5	4 - 5
1 - 6	1	6		2 - 6	3 - 6	4 - 6
1 - 7	1	7		2 - 7	3 - 7	4 - 7

T33 = Establishes the starting time of the generator, programmable from 0 to 23,50 hours

AUTOMATIC LOCK:

Enables to program time and days of the lock device, active even with mains failure.

Select t29 to program the day, then chose "tot" for the total lock and "par" for the partial lock. With "par" you enable the lock start time in t30 and the lock stop time in t31. After d7 (Sunday) you will find the function "BLC", press ENTER for the option between ON to enable the lock function or OFF to disable the lock function.

Programming

T29	=	7 days the week divided in total lock "tot" or partial lock "par", enabled by BLC ON - OFF
D 1	=	Monday
D 2	=	Tuesday
D 3	=	tot = total day lock
D 4	=	par = partial lock, t30 and t31 enabled.
D 5	=	
D 6	=	→ t30 enables lock start
D 7	=	→ t31 disables lock end
BLC	=	ON enables the lock function OFF disables the lock function
T30	=	0 - 23,5 hours and tens to set the lock start in the selected days (t29)
T31	=	0 - 23,5 hours and tens to set the lock stop in the selected days (t29)

When the internal timer locks the generator, on the display appears BLC.



To using the generator in lock mode, use the manual commands.

The lock (Input 7) can be managed manually through a switch or an external timer.

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ALARM REPORT

Memorizes all parameters (measures and alarms) at the moment of a failure, and enables to visualize the last 5 alarms. It is active only with the programming switch in lock position.

To visualize the alarm report press at the same time  and  for 8", "St1" appears, select the report from St1 to St5 with +/- and enter with ENTER

ST1 = last report;

ST2 = the last but one; Ecc;

The following measures are memorized at the moment of the alarm:

1. Mains voltage;
2. Generator voltage;
3. Generator frequency;
4. Current;
5. Working hours;
6. Battery voltage;
7. Start attempts;
8. Oil pressure low;
9. Engine temperature high;
10. Fuel reserve;
11. Water level;
12. Alarm 1 or theft;
13. Emergency;
14. Overload;
15. Failed start

Selecting the measures, after the "I bat" led, you pass to led for failed start. The number of start attempts is displayed.

ST1-2-3-4-5 the active reports are active

Selected the report press and select with +/- to change report.

To go back to menu switch back to AUT the programming switch.

2.8. OPTIONAL EXPANSIONS

For the module GCM01 are foreseen two expansions:

1. Serial module RS232 interfacing with PC, GSM or Modem for remote control; enables to monitoring the commutation status, all parameters (voltage, frequency, current ecc.) and all alarms. It is possible to command the functions AUTOMATIC, automatic TEST, LOCK, FORCED START with gen-set output and RESET. Every communication is registered in a report;
2. Module for the in circuit programming, enables to transfer or modify the program with PC.

The software is supplied only to module with serial output.

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3. PROGRAMMING



3.1. SETTINGS

The programming defines the kind of functioning that can be normal or articulated on need. To simplify the use GCM is given with a standard configuration for a Diesel generator group in emergency to the mains.

To reach the function programming, bring the switch N° 4 in ON position. All displayed measures can be modified. (Ex: 380V into 395 or 378 or in other values)

The first displayed setting field is **(t00)**. To enter press  located on the frontal of the module; by entering in the field the display shows the actual setting. To increase or decrease the adjusted value use + and -.

To confirm the chosen value and pass to the following field press  The setting fields are 46 from **T00** to **T45**. To

move on through the fields use  

The following features are the minimum for the management of a stand-by generating set.
The fields in written round brackets are related fields to the same function.

3.2 TIME SETTINGS

N°	DESCRIPTION	VALUE	FIELD	NEW
T00	Number of starting attempts This establishes how many starting attempts the failed start function is to be enabled.	5	0 - 20	
T01	Starting time and pause This establishes the duration time of the starting and pausing between one starting and another.	5"	0 - 20"	
T02	Mains enabling delay When the mains return within the established limits following the set time, the output is switched from generator to mains.	30"	0 – 255"	
T03	Generator enabling delay The load output is enabled following a set time that is triggered by the motor started signal (minimum 5 sec.)	5"	0 – 255"	
T04	Stopping delay. This establishes the timing required between GE/MAINS switching and stopping to enable the motor to cool down.	20"	0 - 255"	
T05	Starting delay This gives a pre-alarm for the starting procedure and makes the generator insensitive.	1"	0 – 255"	
T06	Glow plug pre-heating time This is the time setting of the sparkplug pre-heating prior to starting.	20"	0 – 20"	
T12	EJP Delay This is the starting delay (the relative input has to be programmed with the EJP function)	27'	0 – 28'	
T28 (T27)	Overload delay When the threshold t27 is overload, the led wait starts flashing and at the end of the time in t28 intervenes the overload alarm.	120"	30-255	

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3.3. ALARM THRESHOLDS

N°	DESCRIPTION	VALUE	Ref. Value400v
T14	Engine working hours for maintenance. It establishes after how many working hours the engine maintenance has to be done. The GCM01 module signals with an acoustic and with a lighting alarm . The defined value must be multiplied by 10.	70 (x10) 700 working hours	0 – 255x10 (2550)
T15	Max. Mains voltage The generator is started. The value is in relation to the programmed normal working voltage (T09).	+ 10% Vn	440 V
T16	Min mains voltage The generator is started. The value is in relation to the programmed normal working voltage (T09).	- 20% Vn	320 V
T15	Max. Generator voltage Alarm triggered and stoppage. The value is in relation to the programmed normal working voltage (T09).	+ 10% Vn	440 V
T16	Min. generator voltage Alarm triggered and stoppage. The value is in relation to the programmed normal working voltage (T09).	- 20% Vn	320 V
T17	Hysteresis alarm threshold Min V It establishes the value of minimum voltage	30 Volts	0 –40 Volts
T18	Hysteresis alarm threshold Max V It establishes the value of maximum voltage	10 Volts	0 – 20 Volts
T25	Max battery charge voltage It establishes the max voltage of the charge battery.	13,5v 27v	13-14,5v 26-29v
T26	Max battery charge current It establishes the maximum current of charge, to adjust to the CB transformator's power.	5A	1-5A
T27 (t26)	Overload current After the delay in t26 starts the cycle alarming and stopping for overload.With 0 Amper the protection from overload is excluded.	0	0-999A

3.4. OPERATING FUNCTIONS

N°	DESCRIPTION	VALUE	FIELD
T07	Preheating or starter function Establishes the preheating or starter function (input 11).	STR	CND o STR GAS
T08	Working frequency selection Establishes the working frequency.	50 Hz	50 – 60 Hz
T09	Engine voltage selection Selection working voltage. It determines the nominal operating voltage. It is possible to select the value of mains voltage and the mains (3-phase or 1-phase). The alarm thresholds (parameters T14 and T15) are calculated in function of this value.	400 Volts	110 – 220 – 230 – 260 – 380 – 400 – 440 – 460 Volts
T10	AT selection This is the AT you can use on your plant.	100/5	25-40-50-60 -100 – 150 – 200 – 250 – 400 – 500 – 600 - 1000/5

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T11	Function selection EJP, SCR or RES. This are the functions of the input EJP SCR or RES (input 7).	SCR	EJP – SCR - RES
T13	Function selection BLC or TST. Establishes the function of BLC or AVV. (Input 8).	BLC	BLC – TST
T40	Alarm or antitheft device This establishes the function of the available (connection 14 free) alarm	All	Fur

3.5. MESURES REGULATION

N°	DESCRIPTION	VALUE
T19	Gen-set frequency reading regulation Enables a fine regulation of the visualization of the gen-set frequency on the display. This allows correcting the differences between the real frequency and the displayed frequency.	
T20	Mains voltage reading regulation Enables a fine regulation of the visualization of mains voltage on the display. This allows correcting the differences between the real mains voltage and the displayed voltage.	
T21	Gen-set current reading regulation Enables a fine regulation of the visualization of gen-set current on the display. This allows correcting the differences between the real current and the displayed current.	
T22	Gen-set voltage reading regulation Enables a fine regulation of the visualization of gen-set voltage on the display. This allows correcting the differences between the real voltage and the displayed value.	
T23	Battery voltage reading regulation Enables a fine regulation of the visualization of battery voltage on the display. This allows correcting the differences between the real voltage and the displayed value.	
T24	Battery current reading regulation Enables a fine regulation of the visualization of battery current on the display. This allows correcting the differences between the real current and the displayed value.	

3.6. CLOCK AND HOUR RECORDING METER



N°	DESCRIPTION	VALUE	
T29 (T30-T31)	“LOCK” days selection It selects the day of the week and establishes if the lock is overall or partial for the single day. It establishes if the functions lock is ON or OFF.	OFF	
T30(T29-T31)	“LOCK” beginning time It establishes the lock beginning time in hours and a dozen minutes, for all the partial programming days in t29.	20	0,0-23,5 hours
T31(t29-t30)	“LOCK” stopping time It establishes the lock stopping time in hours and a dozen minutes, for all the partial programming days in t29.	7	0,0-23,5 hours
T32(t33)	“Automatic test” test days selection It selects the test day on 4 weeks and starts or stops OFF all the functions of automatic test.	OFF	
T33(t32)	“Automatic test” beginning time test It establishes the beginning time test in hours and a dozen minutes, for all the partial programming days in t29.	8,0	0,0-23,5 hours
T34	Working hours of alternated gen-sets It establishes the working hours of alternated gen-sets with a stand-by group. At the end of the time is asked the attendance of the stand-by group. When this is on speed the load is transferred to	4	1-255 hours
T35	“clock “ seconds		0-59 sec.
T36	« clock » minutes		0-59 mnt
T37	« clock » hours		0-23 hours
T38	“clock” days of the week It's a weekly clock, for the correct functioning it must be programmed the day of the week at the moment of the programmation		1-7 day
T39	REPROGRAMMING TOTAL HOURS It permits the reprogramming of the total hours		0-9999 HOURS

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3.7. SELF PROGRAMMING

The module GCM01 is arranged for a self-programming function.

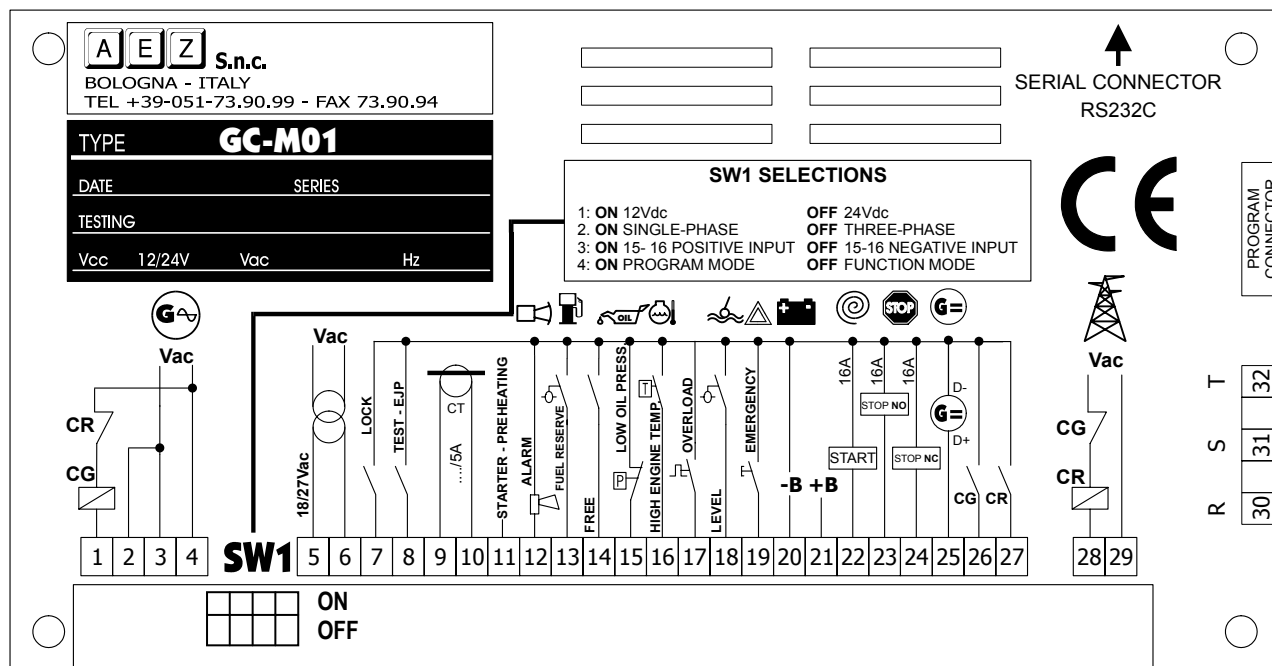
This function is very useful in case of wrong functioning of the module due to mistaken configuration. The self-programming function enables to re-establish all setting fields with a pre-established standard value table.

To carry out the self programming function press at the same time the push buttons  and  for 8 seconds; after this time on the display appears PRG and the module configures itself with the below mentioned parameters:

N°	DESCRIPTION	DEFAULT
T00	Starting attempts	5
T01	Starting time	5 Sec
T02	Mains enabling delay	30 Sec
T03	Generator enabling delay	5 Sec
T04	Stoppage delay	20 Sec
T05	Starting delay	1 Sec
T06	Glow plug pre-heating time or starter	5 Sec
T07	Function selection: PRC or STR	STR
T08	Working frequency selection	50 Hz
T09	Working voltage selection	400
T10	AT value	100
T11	Function selection EJP or SCR or RES	SCR
T12	Starting delay with EJP	27 Min
T13	Function selection: BLC or TST	BLC
T14	Engine maintenance hours	70 (x10)
T15	Alarm percentage selection Max. V	10%
T16	Alarm percentage selection Min. V	20%
T17	Hysteresis alarm threshold Min V	30 V
T18	Hysteresis alarm threshold Max V	10 V
T19	Calibration generator frequency reading	50 Hz
T20	Calibration generator three-phase voltage reading	400V
T21	Calibration generator current reading	100A
T22	Calibration of generator voltage reading	400V
T23	Calibration of battery voltage reading	12/24V
T24	Calibration of battery current reading	5A
T25	Max. Battery charger voltage	13,5/27V
T26	Max. Battery charger current	5A
T27	Overload current	0=OFF
T28	Overload delay	120''
T29	"LOCK" days selection	0
T30	"LOCK" beginning time	20
T31	"LOCK" stopping time	7
T32	"Automatic test" test days selection	OFF
T33	"Automatic test" beginning time	8
T34	Working hours of alternated gen-sets	4
T40	Alarm or antitheft function	ALL

3.8. CONNECTIONS AND RELATIVE DESCRIPTION

The connection of the module GCM01 happens through an extractable strip board, two-way receptacle; this terminal board allows a fast disconnection of the module without intervention need on the single cables.



CONNECTION ON THE LOWER PART

There are 29 terminal boards on extractable connector with two-way receptacle with a capacity of 16A and cross section 2,5 mm².

The wiring diagram of the strip board, the same as on the carter, follows the succeeding numeration:

N° terminal	DESCRIPTION	INPUT OUTPUT
1	Command CG (contact NC 10A)	O
2	Command CG (contact NC 10A)	O
3	Gen-set voltage sensor input 0-260V 60HZ (Gen-set neutral)	I
4	Gen-set voltage sensor input 0-260V 60HZ (Gen-set phase)	I
5	Battery charger input 0-16-29V 5A	I
6	Battery charger input 0-16-20V 5 A	I
7	Functions input LOCK/TEST/EJP2 (programmable)	I
8	Functions input EJP / SCR / RES (programmable)	I
9	Input TA / 5 A (phase X)	I
10	Input TA / 5 A (common)	I
11	Output PREHEATER OR STARTER	O
12	Alarm output 100 mA max.	O
13	Input fuel reserve Alarm	I
14	Input available Alarm	I
15	Input oil pressure low Alarm	I
16	Input water temperature high Alarm	I
17	Input overcharge Alarm	I
18	Input water level Alarm	I
19	Input Emergency	I
20	Module power supply 0-32V 16 A (-Batt)	I
21	Module power supply 0-32V 30 A (+Batt)	I
22	Output start command +B 30 A max	O
23	Output stop command +B 30 A max	O
24	Output auxiliary devices command (15/54) +B 30 A max	O
25	Input battery charger generator 0-32V	I
26	Input gen-set contact maker signal ON	I
27	Input mains contact maker signal ON	I
28	Command CR (contact NC 10A)	O
29	Command CR (contact NC 10A)	O

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3.7.2 CONNECTION ON THE SIDE

There are 3 terminal boards on extractable connector with two-way receptacle with a capacity of 16A; cross-section 2,5 mm². These three terminals are the inputs of the three-phase mains sensor.

N° TERMINAL	DESCRIPTION	INPUT / OUTPUT
30	Phase input R 0-500V, strength 500 KΩ between phase and neutral	I
31	Phase input S 0-500V, strength 500 KΩ between phase and neutral	I
32	Phase input T 0-500V, strength 500 KΩ between phase and neutral	I

On the higher part, is foreseen the output of the connector 9 poles of serial interfacing RS232.

3.9. TECHNICAL FEATURES

PROTECTION DEGREE OF FRONT PANEL:	IP 55
FRONT PANEL ANTISCRATCH WITH SINOTIC GRAPHIC	LEXAN GE
VOLTAGE AC:	0 / 500V ac
FREQUENCY:	50 / 60Hz
VOLTAGE CC	12V or 24V +/- 30%
MAX ABSORBED CURRENT:	1,2 A
MIN ABSORBED CURRENT:	0,7 A
INVERTED POLARITY PROTECTION	Built-in
WORKING TEMPERATURE	From -20 to +80° C
RELATIVE HUMIDITY	80% no condense
POLLUTION PROTECTION	1
RELAY CAPACITY AVV. /ARR./ 15-54	30A 30V cc.
CONTACT MAKERS RELAY CAPACITY CG/CR	10A 250V ca.
I° READING OF RUNNING ENGINE THROUGH ac GEN-SET	From 5 to 8V on 220v Generator
II° READING OF RUNNING ENGINE THROUGH OIL PRESSURE	From 0,5 to 1 bar delayed 3"
BUILT-IN BATTERY CHARGER	5A max
BATTERY PROTECTION, FUNCTIONS	< V 27 and >V 59
GEN-SET PROTECTION, FUNCTION	27 - 59 - 81
OVERLOAD PROTECTION	50
GEN-SET VOLTAGE READING	100/260V ca. single-phase
THREE PHASE MAINS SENSOR WITH DISSYMMETRY	100/500V ca. three-phase
SINGLE-PHASE MAINS SENSOR (prearranged survey from the battery charge trans.)	100/350V c.a. (second d TCB)
INSULATED MAINS SENSOR	= > 8 KV
MAINS LINE PROTECTION AGAINST MIN AND MAX VOLTAGE	< V 27 and >V 59
DIMENSIONS OF THE MODULE GCM01	395 x 218 x 40 mm
WEIGHT OF THE MODULE GCM01	1200g.

N.B.:

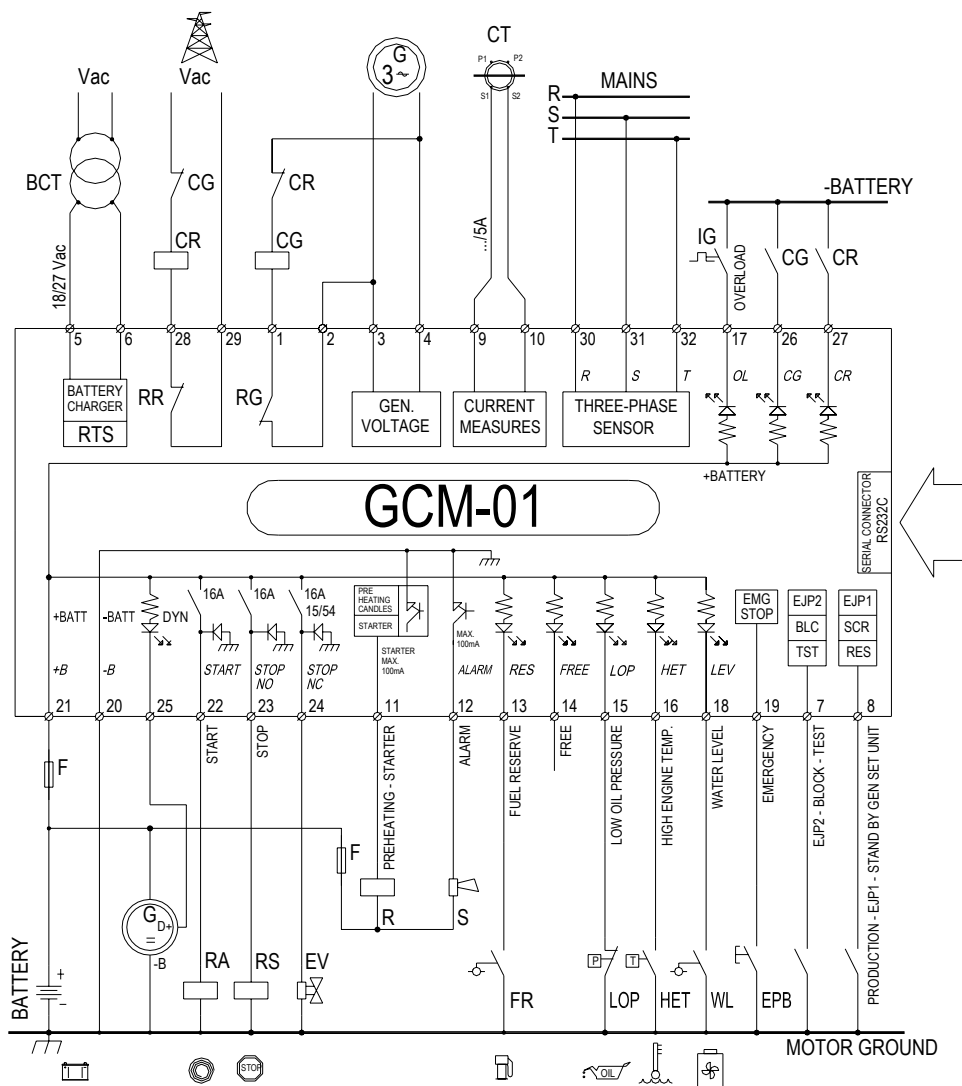
The technical characteristics are subject to modifications without notice following technical improvements.

FUNCTIONS

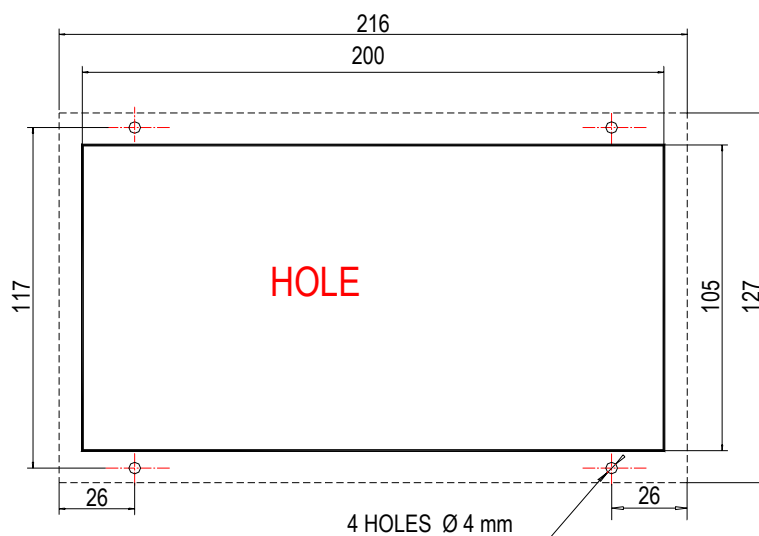
27	Min voltage
59	Max voltage
60	Dissymmetry
81	Protection for min/max frequency
50	Instant current or short-circuit
51	Max current with programmable delay

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- KEYS
- CG GENERATOR CONTACTOR
 - CR MAINS CONTACTOR
 - RR MAINS RELAY
 - RG GENERATOR RELAY
 - IG GENERATOR CIRCUIT BREAKER
 - EV ELECTROVALVE
 - EPB EMERGENCY PUSH BUTTON
 - BCT BATTERY CHARGER TRANSFORMER



Drilling template GCM01



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4. INSTALLATION

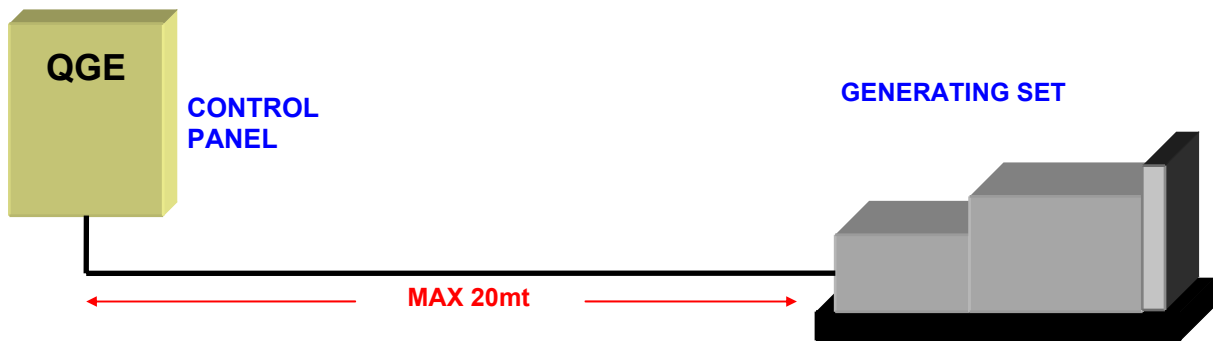
4.1. POSITIONING

The control panel must have a protection rating (IP) suitable for the area in which it will be installed:
IP 42 (normal supply) for closed areas;
IP 55 in the case of possible splashing of water or for control panels exposed to rain.



WARNING!!!

It is advisable not to install the control panel further away than 20 meters from the generator.



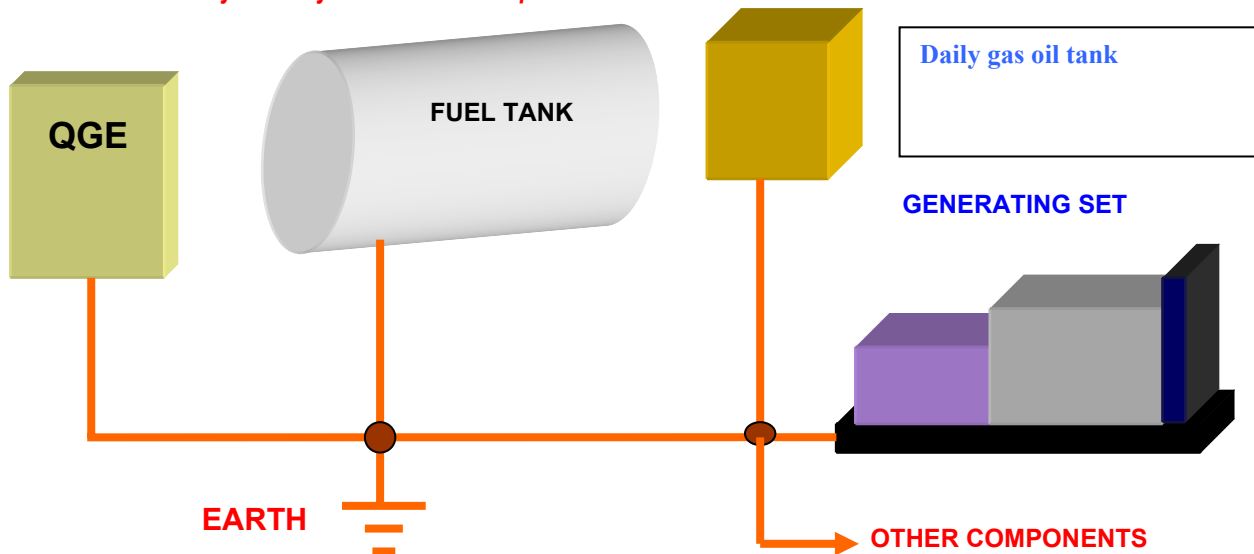
This requirement is due to the excessive currents caused by lightning that hits the public mains causing the voltage inside the control panel to rise excessively if the connection line exceeds 20 meters.

If there is no other choice than installing the control panel further away than 20 meters, our engineering department can provide you with various technical solutions.



WARNING!!

To ensure the reliability of the system all of its components must be connected to earth



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4.2. POWER CONNECTION

To facilitate the set up are furnished schemes of linking and indicative charts for the sizing of the pipelines of the line and auxiliaries. It must be reminded that all the equipments and lines must be protected from short circuit and overloaded. Moreover, for safety all the prevention measures must be adopted against the accidental direct contacts (see normes CEI 64-8/4), for which at the beginning of the wire of arrival mains must be sets an automatic switch of suitable value (and selectivity), on the line of utility on a differential switch.

EN 60439-1	TABEL A1	VALUE FOR ONE SINGLE WIRE	
SWITCHING IN AMPERE I_{th}	NUMBER OF THE WIRES	MIN CROSS SECTION IN mmq	MAX. CROSS SECTION IN mmq
25A	1	2,5	6
40A	1	6	10
60A	1	10	16
90A	1	16	25
110A	1	25	35
125A	1	35	50
160A	1	50	70
200A	1	70	95
260A	1	95	120
350A	1	150	185
400A	1	185	240
500A	2	95	120
630A	2	120	150
800A	2	240	300
1000A	3	240	300
1250A	4	240	300
1600A	5	240	300
2000A	6	240	300
2500A	7	240	300

For further information contact a reliable installation engineer or our engineering department.

4.3. STARTING

It is advisable for the start command to install a servo-relay above the motor, so as to avoid that frequent voltage drops can prevent the starting. Even with few wiring meters between panel board and generator.

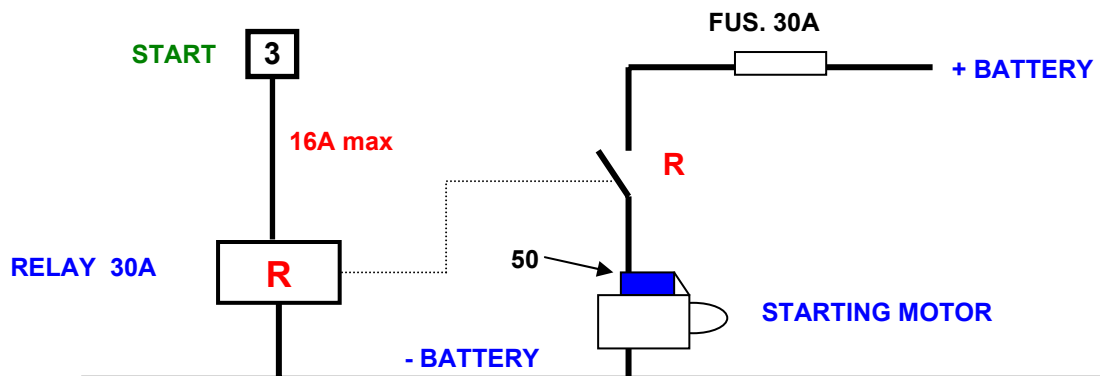


Fig.: 3

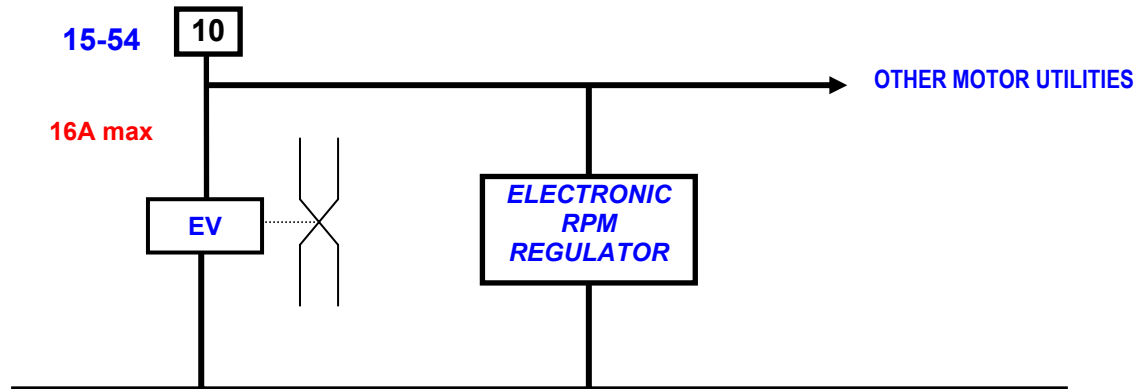
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4.4. STOPPING

The GCM01 module is arranged to command any stopping system.

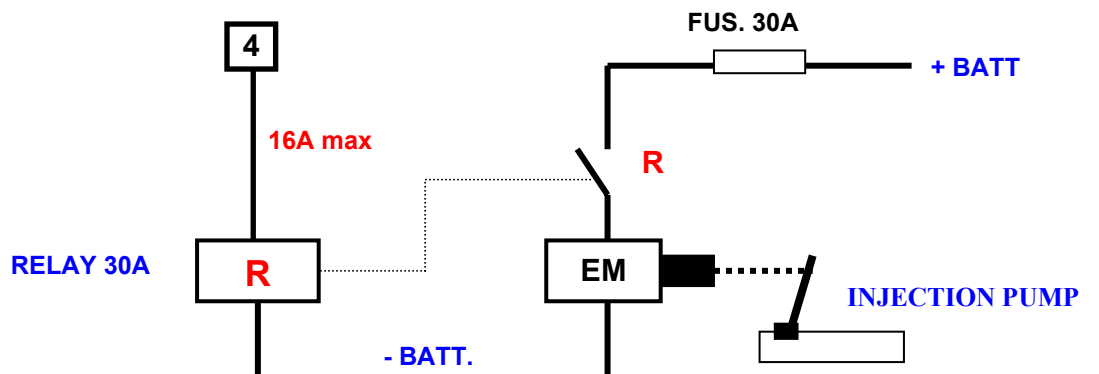
Stoppage with ELECTROVALVE normally energised while the generator is running and while the utilities of the unit are powered.

Connection 7 is defined 15/54; it emits the +B with a maximum current of 16A as the GE starting is commanded to stop when the stoppage command is received.



Stopping with ELECTROMAGNET energised only during the stopping phase.

Connect to the input N° 4 STOP NA (max 16A) and install a servo-relay of 30A because the absorption of the electromagnets usually exceeds 16A.



Operation: with the stopping command the electromagnet is energised and stops the motor. To establish the stoppage of the motor the closure of the oil pressure switch is controlled, which after 20 seconds from when it closed automatically disables the electromagnet thus avoiding settings and adjustments.

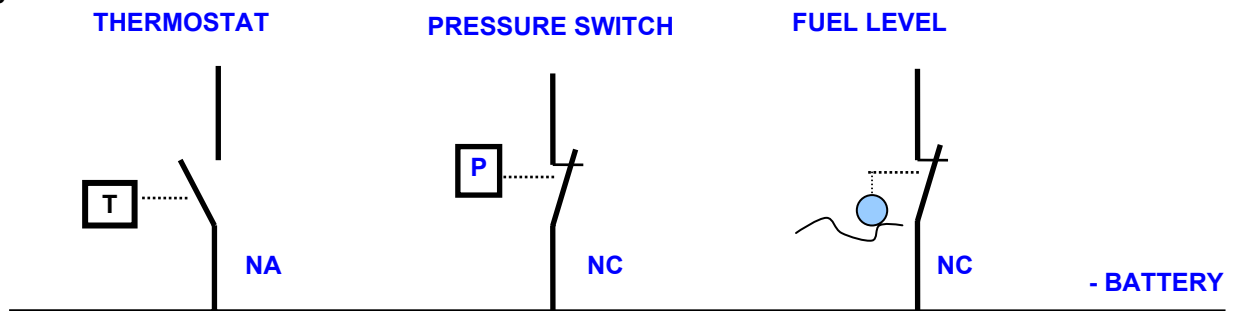
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4.5. MOTOR CONTROLLING PROBES

It reveals the function of the engine, from them we have the complete safety of the same engine. This probes command alarms, low oil pressure, high motor temperature, low gas level. Etc.

PROBE	TYPE	MARK	OHM VALUE	TRIPPING THRESHOLD	MOTOR
OIL PRESSURE SWITCH	NC		ZERO OHM	0,5 Bar	
WATER THERMOSTAT	NA	V D O	OHM INFINITE	93°C	WATER
OIL THERMOSTAT	NA	V D O	OHM INFINITE	120°C	AIR
FUEL LEVEL	NC		ZERO OHM	VAR. 10-20%	

Fig. 5



THE PARAMETERS INDICATED ARE NOT BINDING BUT SUBJECT TO TECHNICAL IMPROVEMENTS WITHOUT PRIOR NOTICE.

4.6. ELECTRICAL STRENGTH TEST

The control panels that are subject to the electrical strength test are to be prepared baring in mind that the only connection point with the electronic logic is established by the MAINS sensor (inputs 21R 22S 23T) to which a divider is connected that is made up of

3 500 K ohm resistors for high voltage, for phase and connected to earth.

Therefore the R - S - T inputs are to be disconnected.

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5. SERVICE PROCEDURES

5.1. SERVICING PROCEDURES

Before proceeding with the functional test:

1. Isolate all fuses
2. Check the connection of the oil pressure switch. If the connection to earth is not present (-B) by means of the oil pressure switch the motor will not start.

Once installation is complete, check its correctness by performing the procedures advised below:

1. Connect the fuses 1 and 2
2. Set the programming switch on ENABLE STARTING
3. The leds oil pressure low and battery charger generator are operative, that's because the motor is not running yet, but the utility supply 15/54 is active.
4. Once the alarms have been checked (in the case of anomalies see the input/output section) briefly press the START push buttons and then the STOP push button and check if the motor stops (there is no need to start the generator).
5. Check if the fuel reserve, low oil pressure and high motor temperature probes match the indications respectively by disconnecting the wire on these and by temporarily connecting it to earth and checking the exactness of the indication on the control panel display.
6. Visually check the power connections between generator and control panel as the board detects the "motor started" status via the voltage of the generator and if it is impossible to detect the voltage (as the power connection is missing or a knife switch along the line is open) the starting motor will continue to run with the motor started for three seconds.
7. With the programming switch on ENABLE STARTING press the start push button until the motor starts.
8. Wait 20/30 seconds and switch to POWER SUPPLY FROM GENERATOR.
9. Check the rotation direction of the motors in use (invert two phases if incorrect).
10. Set the programming switch back to Enable Starting, the CG contact maker will open and the load will be disconnected.
11. Command manual stoppage.
12. Close the remaining fuses.
13. Set the programming switch on POWER SUPPLY FROM MAINS.
14. After at least 15/20 seconds power the control panel with the mains and check the rotation direction of the motors in use again (invert two phases if incorrect).
15. Set the programming switch in AUTOMATIC mode; check, if by disconnecting the mains, all the starting functions are enabled, power output and generator protection. When the mains restored there will be a delay before the lines are switched then a further delay to allow the motor to cool down.

5.2 SERVICING PROCEDURES WHEN MAINS SUPPLYING (ENABLED GEN-SET)

In cases in which the electrical system is started but not the generator, therefore its circuits and battery are practically not powered, the powering of the electronics by the mains is to be avoided as this does not offer the control and safety devices provided by the battery.

Therefore all fuses have to be disconnected, except F4 that supplies only the mains contact maker.

By starting the generator follow the servicing procedures.

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5.3. BATTERY REPLACEMENT PROCEDURE

- Set the programming switch in position Manual mains.
- Disconnect the fuses F1 and F8
- *Replace the battery and re-connect the fuses and program.*



WARNING considering that the battery charger generators output a voltage of between 50 and 150 Volts when disconnected from the battery while the generator is running, which is very destructive for the electronics, the connections must strictly not be touched while the generator is running or the loose cables.

5.4. GCM01 BOARD REPLACEMENT PROCEDURE

- Disconnect the mains line.
- Connect all fuses
- Replace the module
- Copy the programming of the SW1 situated on the strip board.
- Close the fuse F1 battery.
- Programming, if different of standard 400V 50Hz the working voltage and the frequency.
 - Ratio of the TA.../5A
 - Working voltage
 - Working frequency
 - Alarm percentage max voltage
 - Alarm percentage min voltage
 - Threshold hysteresis max voltage
 - Threshold hysteresis min voltage
 - Compare the remaining values with the test board.
- The settings of the type of test TA, the overload and short-circuit current are crucial.
- Re-connect all fuses and check the efficiency.

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6. MAINTENANCE

The control panel has been designed to operate without the need for maintenance. The following is to be kept under control nevertheless:

Every 30-60 days

Every 30 days

Every 30 days

Every 30 days

Every 6 months

check the electrolytic level of the battery.

check the water, oil and fuel levels

check the motor pre-heating temperature (if installed)

run the unit automatic test

check the battery efficiency

6.1. ELECTRICAL MAINTENANCE

See the relative manual for the maintenance of the GENERATOR. The information provided herewith simply relates to the electrical command and control parts of the generator.



WARNING!

The control panel is powered by the mains and by the generator. Before accessing it for maintenance purposes disconnect the mains and stop the generator by setting the programming switch on "LOCKED"

6.2. EFFICIENCY TEST

Efficiency tests of the various automatic functions to be executed with the AUTOMATIC or TEST programs.

The safety devices against min. voltage, min. frequency, low oil pressure and dynamo are enabled when the generator is running at a steady state and following the programmed tripping of the generator delay that enables the load output. Therefore all simulations are to be performed following this timing.

6.3. MOTOR SAFETY DEVICES

Disconnect the wire on the motor from the relative reading probe and connect it to earth for roughly 3 seconds. A buzzer alarm will be triggered the motor will stop and the relative will be displayed.

The functions of each alarm are indicated in the AUTOMATIC RUN MODE section.

6.4. GENERATOR SAFETY DEVICES

Manually operate the lever of the accelerator or actuator to modify the revs. in + or - . Consequently the variation of the Hz frequency will be displayed. Continue until the safety threshold is triggered with consequent alarm status and locking.

Minimum and maximum voltage.

Manually turn the VOLT trimmer on the electronic voltage regulator inside the generator. First turn + or – then vice versa altering the voltage output until the safety devices are tripped. Upon completion set the voltage back to the normal value.

6.5. OVERLOAD PROTECTION 51

Supposing that a load sufficient to exceed the maximum current that may be output is not available it is advisable to modify the calibration of the overload to a value lower than the load current available (see **setting** section).

With the generator in automatic mode, disconnect the MAINS and when the CG generator contact maker has closed enable the load. When the set current is exceeded, following the delay timing, the CG contact maker is opened and the relative LED flashes, the alarm is triggered and the generator stops following the motor delay timing.

Reset the current calibration (maximum current of generator in "ALARM THRESHOLDS" section) after the test has been completed.

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6.6. BATTERY EFFICIENCY

The battery is kept efficient by the automatic battery charger, which controls its charge avoiding oxidation and sulphating. It controls possible rising in voltage caused by the disconnection of internal components and also voltage sagging causes by anomalies in the battery charger. The storage capacity, or rather the capacity of facing up to the number of starting times sufficient to ensure the running efficiency of the generator is to be checked every six months in the following manner:

Check with the battery fully charged, with a voltage greater than 13,5V for generators with 12V batteries and a voltage greater than 27V for generators with 24V batteries.

With the generator in locked mode, disconnect the electromagnet the safety solenoid valve or the actuator or anything else necessary to prevent the generator from starting. The power supply to the injection pump must be prevented so that upon starting the motor turns without starting.

Set the programming switch on TEST, count 4 starting attempts at a rotation speed that is more or less the same from the first to the fourth.

The same procedure can be performed by setting the programming switch on ENABLE START mode and manually commanding the starting attempts for 5 seconds with pauses of 10 seconds for at least 5 times one after the other.

If starting fails after these 5 attempts (minimum 4) the batteries are to be replaced.

6.7. SWITCHING SCALING TEST

If the utility system is modified, check the scaling of the mains/generator line switching. The maximum load current must not exceed the switching limit values indicated on the internal nameplate.

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6.8. TROUBLE SHOOTING

All control panels are marked with a work order number written on the test nameplate inside the panel. All the technical and constructional data of the control panel are associated with the work order number therefore you must refer to this when requesting technical assistance or spare parts.

The following details must be indicated in any event:

- | | |
|--|-----------------------------|
| 5. Type of electronic board | (indicated on front panel); |
| 6. Battery voltage | (12 or 24V); |
| 7. Mains voltage | (230 or 400V); |
| 8. Generator capacity | (KVA); |
| 9. Frequency | (50-60 Hz); |
| 10. Indications displayed on GCM02 module when the problem occurs; | |
| 11. Operational mode (AUT. or MAN); | |

Battery led off	Failed starting	Attempt to start	Brief and rapid starting	Failed starting alarm	Alarm status triggered immediately	Failed generator output	Failed mains output	Failed stoppage	Nothing is working	PROBABLE CAUSE	SOLUTION
•	•	•	•	•						Flat battery	Fuse 8 4A of battery charger
•	•	•	•	•						Flat battery	Battery charger
•										Battery with inverted polarity	Check and invert cables
•	•	•	•	•						Loose or oxidised battery connections	Clean, tighten and lubricate battery terminals.
•	•								•	16 A battery fuse blown	Replace the fuse 10x38 16 A
				•						The pinion fails to engage in the crown wheel	Replace pinion or whole starting motor
	•									No connection with oil pressure switch	Connect and check the connection to earth of the pressure switch.
					•					Excessive speed upon starting	Calibrate the electronic revs. regulator.
					•					Immediate alarm due to fuel reserve	Fill up with fuel or disconnect level device
					•					Immediate alarm due to excessive voltage	Replace the voltage regulator.
					•					Low oil pressure	Replace pressure switch.
					•					High motor temperature	Replace thermostat
						•				Fuse2 blown	Replace 10x38 fuse with identical fuse
						•				Remote switch coil burnt	Replace coil
						•				No voltage output by generator	Request assistance
							•	•		Fuse4 blown	Replace fuse with identical fuse
							•	•		Remote switch coil burnt	Replace coil
							•	•		Fuses 3 and 5 blown	Replace 10x38 fuses with identical fuse
							•			Not earth reference on mains sensor	Check earthing of generator control panel and accessories
								•		Defect in stopping system	Clean from dirt, lubricate or replace
									•	Emergency stop push button pressed	Turn and pull up to release push button
					•					Motor too cold	Repair or replace pre-heating system

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